# Cyberbomb

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*Published in:*
Group Processes & Intergroup Relations: GPIR

*DOI:*
10.1177/1368430210389084

*Publication date:*
2011

*Document Version*
Publisher's PDF, also known as Version of record

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*Group Processes Intergroup Relations* published online 2 February 2011
DOI: 10.1177/1368430210389084

*Article*

*Group Processes & Intergroup Relations*

G P I R

# Cyberbomb: Effects of being ostracized from a death game

*Group Processes & Intergroup Relations*
1–16

DOI: 10.1177/1368430210389084
gpir.sagepub.com
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**Abstract**

Recent research has shown that ostracism is distressful regardless of mitigating circumstances, providing evidence that humans are hard-wired to be hypervigilant to ostracism cues. Arguing that it is also highly adaptive to avoid being in a situation that signals a threat to survival we reasoned that the immediate distress to ostracism would be mitigated in a game of bomb-toss (Cyberbomb) compared to a game of ball-toss (Cyberball). Results showed that such a symbolic threat to survival is able to reduce the immediate distress caused by ostracism (Study 1 and Study 2), and—when the negative consequences of not surviving are highlighted—still powerful enough to induce aggression to fellow game players (Study 2). Taken together the studies speak to the often assumed but relatively untested relation between exclusion and survival that has been proposed in theories on belonging, exclusion and ostracism.

**Keywords**

aggression, ostracism, peer-rejection, survival

Paper received 20 July 2010; revised version accepted 8 October 2010.

Ostracism is any behavior in which a group or individual excludes and ignores another group or individual. Research has now amassed considerable insight into how individuals respond to ostracism and related aversive interpersonal behaviors of social exclusion and rejection. One of the more provocative findings in this type of research is that the immediate responses to ostracism are distressful regardless of mitigating circumstances. Research has now shown that people are hurt by ostracism regardless of the disposition of the person who is ostracized (Zadro, Boland, & Richardson, 2006), regardless of the social categorization of fellow group members (Gonsalkorale & Williams, 2007; Smith & Williams, 2004; Williams, Cheung, & Choi, 2000; Zadro, Williams, & Richardson, 2004), and even when

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they are financially compensated (Van Beest & Williams, 2006). To extend this type of research we draw attention to the underlying assumption that responses to ostracism have an adaptive value. Humans are social to the core. Others provide nurturance, security, mating opportunities, and reciprocity. Put differently, without others we would simply not survive (Baumeister & Leary, 1995; Gruter & Masters, 1986; Kerr & Levine, 2008; Leary, 2001; MacDonald & Leary, 2005; Williams, 2009).

We argue that the failure to mitigate how people experience ostracism may in part be attributed to the fact that previous research used cross-cutting variables that are not directly related to survival and therefore require more cognitive processing to properly appraise whether one is ostracized from a positive or a negative situation. To test this assumption we assessed how individuals would respond if they were ostracized from a situation that we assumed is more related to survival than, for example, the social categorization of fellow group members or whether one is financially compensated. We tested how people would respond when ostracized from a simulated game of Russian roulette. Would such a setting finally reduce the immediate distress of ostracism?

## *A temporal model of responses to ostracism*

The theoretical backbone of our reasoning is provided by a recent model of ostracism arguing that reactions to ostracism follow three temporal stages: *reflexive*, *reflective*, and *resignation* (Williams, 2009).

*Reflexive reactions* describe how people experience ostracism. This term is used to describe that immediate reactions to ostracism occur without much deliberate thinking and without taking mitigating factors into account. In accordance with error-management theory (Buss, 1991; Haselton & Buss, 2000), the reflexive system "detects first, and asks questions later" as if guided by an evolutionary principle of "better safe than sorry". Evidence that the immediate response to ostracism is powerful, biased towards over-detecting and fast is provided by many experiments. First, underscoring that ostracism is quite powerful, large effect sizes emerge from a virtual ball toss game—Cyberball (Williams & Jarvis, 2006; Williams et al., 2000)—in which participants neither know, see, nor expect to meet their co-players. Simply not getting the ball in a 3-min game of Cyberball is sufficient to cause increased self-reported levels of sadness and anger, and lower self-reported levels of belonging, self-esteem, control, and meaningful existence.

Second, stressing that such immediate responses are biased towards over-detecting and consequently relatively impervious to cross-cutting variables that ought to relieve the experience of ostracism, a host of experiments have now failed to mitigate the immediate experience of ostracism. Indeed, as we already mentioned above, immediate reactions to ostracism are no less painful when individuals are ostracized by outgroup members than by ingroup members (Smith & Williams, 2004; Williams et al., 2000); even when those outgroup members are despised (i.e., the KKK—Gonsalkorale & Williams, 2007). Similarly, we experience immediate distress when ostracized by humans, but no less distress than when we are ostracized by a computer (Zadro et al., 2004). Even when ostracism benefits the individual financially, and inclusion is financially costly, ostracism is just as distressing (Van Beest & Williams, 2006).

In fact, numerous studies on humans and other social animals have now shown that social pain—the pain experienced upon social injury when social relationships are threatened—and physical pain—the pain experienced upon bodily injury—overlap in their neural circuitry and computational processes providing a mechanism why immediate reactions are fast and biased towards over-detecting (for reviews of this neurological evidence see Eissenberger & Lieberman, 2004). For example, Eisenberger, Lieberman, and Williams (2003) used functional magnetic resonance imaging (fMRI) to examine brain activity of ostracized Cyberball players. They found an increase in activation in the same region of the brain (the dorsal anterior cingulated cortex, dACC) that is also activated when individuals experience physical pain. Moreover, lending support that self-reports that are directly assessed after the ostracism episode are a good proxy of

how people feel during the ostracism episode, dACC activation levels were positively correlated with the self-report of fundamental need satisfaction and mood ($r = .88$). Taken together, these findings strongly support the position that detection of ostracism is quick and crude, erring in favor of detection when higher cognitive appraisal would indicate no danger—and in the case of Van Beest and Williams (2006), even a benefit—exists.

Once the individual is able to reflect upon the situational constraints of the ostracism episode, they enter the *reflective* stage. This stage describes coping and goal directed behaviors of individuals that are ostracized. On this stage individuals have formed a more thorough appraisal of the situation. Consequently, such reflective responses need not be uniformly negative and should be affected by cross-cutting variables that mitigate the appraisal of the ostracism episode (Chow, Tiedens, & Govan, 2008; Oaten, Williams, Jones, & Zadro, 2008; Van Beest & Williams, 2006; Warburton, Williams, & Cairns, 2006). For example, Chow, Tiedens, and Govan (2008) manipulated the reason why participants were not selected to participate in a game of Dodge ball. Results showed that participants were more likely to retaliate when given an unfair reason than a fair reason for not being selected. Moreover, Warburton et al. (2006) manipulated the possibility to control an irritating sound and observed that ostracized participants from Cyberball were only aggressive towards unrelated others when they could not control the unset of this irritating sound. To give a final example, Van Beest and Williams (2006) showed whereas immediate reactions of ostracized people were not affected by the financial consequences of being ostracized, their delayed reactions were responsive to the financial outcome. On the reflexive level ostracized people reported lower levels of belonging, control, self-esteem, and meaningful existence regardless of financial incentives. On the reflective levels they were less likely to retaliate when it was financially beneficial to them being ostracized than when it was financially costly.

Finally, in the *resignation* stage, individuals who are subjected to long-term or frequent acts of ostracism are hypothesized to show depletion of all coping mechanisms, resulting in helplessness, feelings of worthlessness, alienation, and depression (Williams & Zadro, 2005). Support for this stage comes primarily from qualitative interviews with long-term ostracism targets. When asked why she did not leave her husband after he had given her the silent treatment for 40 years, the woman said, "I didn't think anyone else would want me; at least I had a roof over my head" (Williams, 2001).

## *The present research*

In the current studies we focus on the reflexive and reflective stages. We argue that previous research has tested the power of ostracism by using cross-cutting variables that are only indirectly linked to survival and argue that this might be the reason why this research has failed to mitigate the immediate experience of ostracism. To find boundary conditions, we propose, cross-cutting variables should have a more direct link to survival than those that require a more elaborate cognitive appraisal and evaluation. We therefore decided to confront participants with the most direct threat of survival that we could think of: death. What if individuals are ostracized from a situation in which they could die?

Of course, our participants were never in any real danger of dying during our studies. Instead, we devised a bomb tossing variant (i.e., Cyberbomb) of Cyberball in which we merely displaced the ball with a bomb (see Figure 1 for a snapshot of the graphical presentation of both games). However, it is important to realize that the immediate reaction to such a symbolic death game should operate as quick and crude as we assume reactions to ostracism are. For example, research on terror management has repeatedly shown that rather subtle reminders of death act quickly, especially when encountered surreptitiously (Greenberg, Solomon, & Pyszczynski, 1997). Moreover, recent research comparing symbolic and physical extinction threats showed that both induce angst and the desire to strengthen one's own group, suggesting that responses to a symbolic survival

threat may illicit similar responses as actual threats (Wohl, Branscombe, & Reysen, 2010). Finally, fMRI research has shown that imagining physical injury is painful, again suggesting that symbolic threats may operate in similar ways as actual threats (Ogino et al., 2007). In sum, although our participants were never in any real danger, we propose that our symbolic survival threat sends a powerful message that requires not much cognitive processing to infer that it is actually a good thing to be ostracized from Cyberbomb. Consequently, we may observe that people find it less distressing to be ostracized from Cyberbomb than from Cyberball.

## Study 1: Fundamental needs and mood in Cyberbomb

As discussed, previous research finds that situational manipulations that, logically speaking, ought to either increase or decrease the impact of ostracism are not sufficient to moderate how people experience ostracism. However, if the situational manipulation involves detection of another source of survival threat, then moderation should occur of such immediate reflexive reactions. By manipulating the type of game from which people are ostracized (ball-toss vs. bomb-toss), we now expected to find moderation in the reflexive stage. In Cyberball we expected to replicate the findings that have consistently been documented with this and other paradigms: individuals should be distressed when ostracized. In Cyberbomb we had different expectations. Although we did anticipate that reactions to ostracism would still be negative (because it still implies exclusion from a social event) we expected that these reactions would be less negative than when compared to ostracism in Cyberball because being included in an online bomb game ought to trigger threat detection, and being ostracized would provide an escape from such a threat. Cast in terms of our dependent variables, we expected that people would be less satisfied in terms of fundamental needs and mood when ostracized from Cyberball than when ostracized from Cyberbomb.

### *Method*

**Participants and design** Participants were 87 students from Leiden University (14 men, 73 women; Mean age = 20.80, SD = 2.15) and randomly assigned to a 2 (Game type: Cyberball, Cyberbomb) × 2 (Game experience: Ostracized, Included) between-S design. They were paid 5 euros for their participation.

**Procedure** The general outline of the procedure was based on previous research on Cyberball (e.g., Van Beest & Williams, 2006). Participants were seated behind a computer in separate cubicles. All instructions were presented on the computer screen. The participants were told that they were participating in a study about the relation between mental visualization and task performance and informed that mental visualization could be best exercised through a virtual toss game between three players. We told participants that they were playing with two other participants and ensured that participants were not aware that these other participants were actually programmed computer players.

Game type was manipulated by changing the object that participants would be tossing (see Figure 1). In the ball condition they merely threw a ball around, as in previous Cyberball experiments. In the Cyberbomb condition, however, participants were informed that they would be tossing a bomb (depicted as an old fashioned round cannonball type bomb with a lit fuse) that could explode at any moment. It was made clear that the person holding the bomb would then die. In both conditions we programmed the game so that it would not stop when the participants were holding the bomb or ball. Moreover, we programmed the Cyberbomb game so that the bomb did not explode during the game. This ensured that participants experienced survival threat during the entire game (see also Van Beest & Williams, 2006 for a similar procedure with money).

Game experience was manipulated by the use of programmed computer players in a 30-toss game. In the inclusion conditions these computer players were programmed to throw the ball 10 times to the participant (i.e., 33% of the total

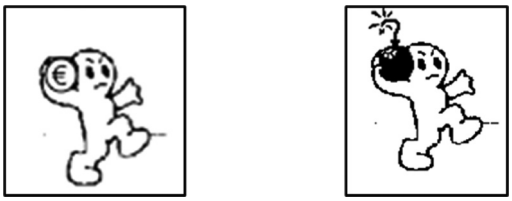

**Figure 1.** Virtual Cyberball players were shown to be throwing either a ball (left) or a bomb (right).

throws). In the ostracized conditions the computer players were programmed to throw the bomb/ball twice at the beginning of the game to the participant, and then only to each other for the remainder of the game.

Next, participants filled out a need satisfaction index and mood index that was adapted from Van Beest & Williams (2006). This need satisfaction index assessed the extent to which belonging (e.g., during the game I felt alone), control (e.g., during the game I felt in control), self-esteem (e.g., during the game I felt insecure), and meaningful existence (e.g., during the game I felt that my presence was meaningful) are satisfied ($\alpha$ = .95). In addition we also assessed a series of mood items (anger, hurt, sadness, happy, elated, cheerful, $\alpha$ = .89). Responses to all these questions were recorded on a 7-point scale anchored on the ends with the terms (1) strongly disagree and (7) strongly agree. Moreover, we reverse coded the negative questions. To interpret the analyses of these measures one should thus keep in mind that a high number is associated with need fulfillment and more positive affect whereas a low number is associated with need threat and more negative affect.

To check the game type manipulation we asked participant whether it was dangerous to play the tossing game (1 = not at all dangerous), 7 = very dangerous). To check the game experience manipulation we asked participants to recall the percentage of ball/bomb throws that were thrown to them. At the end of the experiment we fully debriefed the participants. We explained that they had not played with other participants but with preprogrammed computer players.

**Table 1.** Means and standard deviations (within brackets) of reflexive responses by game type (bomb, ball) and game experience (ostracism, inclusion) in Study 1

| | Bomb | | Ball | |
|---|---|---|---|---|
| | Ostracism | Inclusion | Ostracism | Inclusion |
| Needs | 3.41 (.67) | 5.02 (.78) | 2.37 (.64) | 4.71 (3.41) |
| Mood | 4.30 (1.09) | 5.14 (.84) | 3.31 (1.16) | 5.18 (4.30) |

*Note*: Assessment of needs and mood were made on seven-point scales.

## *Results*

**Manipulation checks** The manipulations appeared to be successful. The check on game type yielded only a main effect of game type, $F(1, 83) = 260.82$, $p < .001$, $\eta^2 = .76$. Participants indicated that it was more dangerous to participate in the bomb game ($M = 5.89$, $SD = 1.60$) than in the ball game ($M = 1.44$, $SD = .79$). The check on game experience yielded only a main effect of ostracism, $F(1, 83) = 253.07$, $p < .001$, $\eta^2 = .75$. Included participants ($M = 32.75\%$, $SD = 10.74$) reported to have caught more bombs/balls than ostracized participants ($M = 5.25\%$, $SD = 3.54$).

**Reflexive responses** We predicted that Cyberbomb would mitigate reflexive responses to ostracism. This prediction was supported by the data of both need satisfaction and mood (see Table 1).[1]

The 2 × 2 ANOVA on the need satisfaction yielded a main effect of game experience, $F(1, 83) = 122.06$, $p < .001$, $\eta^2 = .60$ a main effect of game type, $F(1, 83) = 14.24$, $p < .001$, $\eta^2 = .15$, and the predicted interaction of game experience and game type, $F(1, 83) = 4.09$, $p < .046$, $\eta^2 = .05$. Simple main effect tests comparing ostracism and inclusion showed that need satisfaction was lowered more by ostracism in Cyberball, $F(1, 83) = 83.30$, $p < .001$, $\eta^2 = .50$, than in Cyberbomb, $F(1, 83) = 41.22$, $p < .001$, $\eta^2 = .32$. Moreover, simple main effect tests comparing Cyberbomb and Cyberball showed that Cyberball lowered need satisfaction in the ostracism condition, $F(1, 83) = 15.15$, $p < .001$, $\eta^2 = .15$, but not in the inclusion condition, $F(1, 83) = 1.55$, *ns*.

The 2 × 2 ANOVA on our mood scale yielded also a main effect of game experience, $F(1, 83) = 37.00, p = .001, \eta^2 = .31$, a main effect of game type, $F(1, 83) = 4.49, p < .05, \eta^2 = .05$, and the predicted interaction of game experience and game type, $F(1, 83) = 5.24, p < .05, \eta^2 = .059$. Simple main effect tests comparing ostracism and inclusion showed that mood was more negatively affected by ostracism in Cyberball, $F(1, 83) = 34.24, p < .001, \eta^2 = .30$, than in Cyberbomb, $F(1, 83) = 7.29, p < .01, \eta^2 = .08$. Moreover, simple main effect tests comparing Cyberball and Cyberbomb showed that Cyberball lowered mood in the ostracism condition, $F(1, 83) = 8.99, p < .01, \eta^2 = .15$, but not in the inclusion condition, $F(1, 83) = .01$, *ns*.

### *Discussion*

Study 1 showed that reflexive responses to ostracism are moderated by whether the game is depicted as a ball toss or bomb toss. As predicted, participants were hurt less by ostracism in a game of bomb toss than in a game of ball toss. This finding adds to the literature in several important ways. Speaking to the intimate relation between belonging and survival that is central in theories on ostracism and exclusion, we show that merely adding a fuse to a ball is enough to succeed where others have failed. Apparently, the inability to find moderation in previous ostracism studies may be because the factors investigated were too "high-level" requiring a more thorough cognitive appraisal. Finally, the fact that we used identical reflexive measures as previous research increases confidence that the inability to find moderation in previous research cannot be attributed to weak or different dependent variables. This provides further support that such self-reported need satisfaction and mood that are directly assessed after the ostracism episode are indeed a good proxy of social pain (Eisenberger et al., 2003; Williams, 2009).

## Study 2: Aggressive behavior in Cyberbomb

In Study 2 we extended our analyses in several directions. One extension was to assess how ostracism relates to another situation in which people are singled out. For this purpose we expanded our experimental design by introducing an over-inclusion condition (cf. Van Beest & Williams, 2006; Williams et al., 2000). This over-inclusion condition allowed us to test whether people respond differently when they stand out by not getting any attention (ostracism condition) compared to when they stand out by being in the center of attention (over-inclusion condition). One benefit of this extra condition is that it addresses the potential alternative explanation that ostracism effects are not driven by the fact that people are ostracized but driven by the fact that people stand out. A related benefit is that is underscores that being singled out is a relative experience. After all, our manipulation of game type did not moderate need satisfaction or mood when participants are equally included. The more important benefit is that it allowed us to compare ostracism and over-inclusion in Cyberbomb. That is, how people respond to two negative situations.

Typically, in the few instances in which over-inclusion has been used (Van Beest & Williams, 2006; Williams et al., 2000) people respond more positively when over-included in a positive situation than when included in a positive situation. Moreover, people respond more negatively when over-included in a negative situation than when included in a negative situation (Van Beest & Williams, 2006). However, Van Beest and Williams also showed that people felt more distressed when ostracized from a financially threatening situation than when over-included in such a financially threatening situation. Apparently, and consistent with theories on belonging (Baumeister & Leary, 2005), sociometer theory, and ostracism (Williams, 2009), humans derive value from being the center of attention even when the valence of this attention is rather negative. In similar vein, we hypothesized that being over-included in Cyberbomb would be perceived as a negative experience compared to being equally included in Cyberbomb, but perhaps less negative compared to being ostracized in Cyberbomb.

The second extension of Study 2 was to assess how people respond to ostracism when they have had more time to form a thorough appraisal of

the situation. In addition to the reflexive responses that we assessed in Study 1 we now also assessed reflective responses. To extend research on the link between exclusion and aggression (see also, Ayduk, Gyurak, & Luerssen, 2008; Chow et al., 2008; Leary, Kowalski, Smith, & Phillips, 2003; Twenge, Baumeister, DeWall, Ciarocco, & Bartels, 2007; Twenge, Baumeister, Tice, & Stucke, 2001; Warburton et al., 2006), we set out to analyse whether, or more specifically under which conditions, the reduced distress of ostracism in Cyberbomb would be still be powerful enough to evoke retaliation.

For this purpose is should be recalled that we argue that Cyberbomb is a setting that could be perceived as a threat to survival. One operational consequence of this assumption is that death thoughts ought to be more accessible in a Cyberbomb setting than in a Cyberball setting. To test this assumption we conducted a classroom exercise in a large Midwestern university in the USA (28 men; 24 women; Mean age 22.10 years, $SD$ = 0.87). In the exercise participants were instructed to read the cover story that we used in Study 1 to introduce either Cyberbomb or Cyberball. The accessibility of death thoughts was measured by a word-fragment completion task that has successfully been used by others (e.g., Greenberg, Pyszczynski, Solomon, Simon, & Breus, 1994; Schimel, Hayes, Williams, & Jahrig, 2007). Participants were presented with 20 word fragments of which six could be completed in a death or nondeath related way. For example, one of the fragments consisted of the letters COFF_ _ and could be completed as COFFIN or as COFFEE. The other possible death-related words were *killed*, *buried*, *death*, *skull* and *grave*. Supporting our assumption that Cyberbomb can be perceived as a survival threat, death thoughts were more accessible when participants read the cover story of Cyberbomb ($M$ = 1.09, $SD$ = 0.86) than the cover story of Cyberball ($M$ = 0.63, $SD$ = 0.53), $F(1, 48) = 6.99$, $p < .01$, $\eta^2 = .10$.

The more important operational consequence is that one should thus be able to increase or decrease the impact of Cyberbomb on retaliation when people are able to ponder the consequences of dying. For this purpose we turned to Dechesne and colleagues (2003) who introduced an intriguing afterlife manipulation. They argued that the assurance of an afterlife should lessen the cognitive appraisal of death's negative consequences whereas the denial of an afterlife should increase the cognitive appraisal of death's negative consequences. Taking a slightly different interpretation, we assumed that the assurance of an afterlife conveys a sense of belonging because it conveys the promise that one will be permanently reunited with one's family, friends and other loved ones. Provided that such a promise of belonging reduces aggression, we thus argued that the assurance of an afterlife would reduce aggression, especially when actual belonging needs are most thwarted. Hence, we argued that assuring individuals of the existence of an afterlife should have a more positive impact in the ostracism condition in which people are completely deprived of attention than in the inclusion and over-inclusion condition in which individuals are still worthy of attention by their fellow game players. We thus expected that the assurance of an afterlife would reduce aggression towards fellow game players in the ostracism condition, but not—or at least to a lesser degree—in the inclusion and over-inclusion conditions. Crucial in this hypothesis is of course our underlying assumption that Cyberbomb is related to death whereas Cyberball is not. Hence, we are not saying that the assurance of an afterlife will reduce aggression regardless of whether people are ostracized from Cyberbomb or Cyberball. Our hypothesis is more specific: We hypothesize that the assurance of an afterlife should especially reduce retaliation when death is salient and thus in Cyberbomb.

## *Method*

**Participants and design** Participants were 183 students from Leiden University (146 women; Mean age = 20.95, SD = 2.40) and randomly assigned to a 2 (game type: cyberball, cyberbomb) x 3 (game experience: ostracized, included, over-included) x 2 (afterlife: yes, no) full factorial design.

**Procedure** Study 2 contained three distinct phases that were presented as unrelated studies. In the first phase we introduced our manipulation

of afterlife. Following Dechesne et al. (2003), participants were informed that they would participate in a study about text recall. In the afterlife conditions, participants read a bogus scientific article stating that leading medical investigators found considerable evidence of the probability of a continued existence after physical death. In the no afterlife conditions, the article informed participants that near death experiences can be readily explained by physiological and psychological processes.

In the second phase we introduced the game type and game experience manipulations. Depending on condition participants were either ostracized or included, or over-included in a bomb or ball tossing game. Again there were 30 tosses. In the over-inclusion condition both computer players only threw the bomb/ball to the participant. In the inclusion condition the computer players ensured that each player of the game got an equal number of bomb/ball tosses. In the ostracism condition each computer player threw the bomb/ball only once to the participant. As in Study 1, we ensured that the game ended when the players were not holding the bomb/ball. After the game, participants filled out the need satisfaction index ($\alpha = .92$), the mood index ($\alpha = .85$), and the manipulation checks of game experience, game type, and afterlife. The manipulation check of game type and game experience were identical to the previous study. The manipulation check of afterlife consisted of two questions (There is life after dead; Death is only the physical ending of one's existence, $\alpha = .70$).

In the third phase we introduced our measure of aggression. Using an adaptation the Lieberman, Solomon, Greenberg, and McGreggor (1999) procedure, aggression was measured as the amount of hot sauce participants allocated to one of the other players (see also Warburton et al., 2006). In essence, in line with a cover story of sensory perception, participants were led to believe that they would either taste or deliver (rigged so that they would always deliver) a food substance (rigged to always be hot sauce), and that the other individual's taste preferences would be known to them (rigged so that the other person always indicated they hated hot spicy food). The point of this paradigm is to ensure that participants know that the more hot sauce they deliver, the more they are hurting another person. It was made clear that the other person was one the fellow players of Cyberball/Cyberbomb. Hence, our measure of hot sauce allocation should not be seen as a measure of displaced aggression. Instead, it is a measure of retaliation. After participants prepared a taste sample they were fully debriefed. Participants were thanked and paid 5 euros for their participation.

## *Results and discussion*

**Manipulation checks** All manipulations appeared to be successful. A 3 × 2 × 2 ANOVA on the manipulation check of game experience yielded only a main effect of game experience, $F(2, 171) = 435.81$, $p < .001$, $\eta^2 = .84$. The over-included participants ($M = 75.78$ %, $SD = 19.72$) reported to have caught more bombs than the included participants ($M = 34.39$ %, $SD = 9.38$) who in turn reported to have caught more bombs than the ostracized participants ($M = 6.23$ %, $SD = 5.09$). Tukey's HSD tests showed that all these means were statistically different. A 3 × 2 × 2 ANOVA on the manipulation check of game type yielded only a main effect of game type, $F(1, 171) = 291.97$, $p < .001$, $\eta^2 = .63$. Participants indicated that it was more dangerous to participate in the bomb game ($M = 5.70$, $SD = 1.68$) than in the ball game ($M = 1.91$, $SD = 1.20$). A 3 × 2 × 2 ANOVA on the manipulation check of afterlife yielded only a main effect of our afterlife manipulation, $F(1, 171) = 6.57$, $p < .01$, $\eta^2 = .04$. Participants in the afterlife conditions ($M = 4.79$, $SD = 1.73$) believed more in the existence of an afterlife than in the no afterlife conditions ($M = 4.1$, $SD = 1.73$).

**Reflexive responses** See Table 2 for means and standard deviations of the reflexive responses to ostracism.[2] The 3 × 2 × 2 ANOVA on our need satisfaction scale yielded a main effect of game experience, $F(2, 171) = 89.96$, $p < .001$, $\eta^2 = .53$, and the predicted interaction effect of game experience and game type, $F(1, 171) = 8.83$,

**Table 2.** Means and standard deviations (within brackets) of reflexive responses by game experience (ostracism, inclusion, over-inclusion), afterlife (afterlife, no afterlife) and game type (Cyberball, Cyberbomb) in Study 2

| | Ostracism | Inclusion | Over-inclusion |
|---|---|---|---|
| Cyberbomb | | | |
| Afterlife | | | |
| Needs | 3.31 (1.05) | 5.20 (.84) | 4.63 (1.09) |
| Mood | 4.58 (1.75) | 5.03 (.85) | 4.70 1.39 |
| No afterlife | | | |
| Needs | 2.95 (.77) | 5.04 (.86) | 4.46 (.78) |
| Mood | 4.61 (1.29) | 5.29 (.79) | 4.88 (1.03) |
| Cyberball | | | |
| Afterlife | | | |
| Needs | 2.19 (.46) | 5.10 (.95) | 5.21 (1.46) |
| Mood | 3.84 (1.15) | 5.31 (.99) | 5.06 (1.50) |
| No afterlife | | | |
| Needs | 2.54 (.98) | 4.75 (1.31) | 5.13 (1.34) |
| Mood | 4.20 (.87) | 5.15 (.82) | 5.33 (1.19) |

*Note:* Assessment of needs and mood were made on 7-point scales.

**Table 3.** Means and standard deviations (within brackets) of hot sauce in grams by game experience (ostracism, inclusion, over-inclusion), afterlife (afterlife, no afterlife) and game type (Cyberball, Cyberbomb) in Study 2

| | Ostracism | Inclusion | Over-inclusion |
|---|---|---|---|
| Cyberbomb | | | |
| Afterlife | 12.35 (5.71) | 12.86 (3.80) | 16.56 (11.11) |
| No afterlife | 24.14 (16.31) | 11.20 (2.33) | 18.78 (15.32) |
| Cyberball | | | |
| Afterlife | 19.42 (15.35) | 12.81 (5.57) | 11.72 (2.63) |
| No afterlife | 15.49 (8.01) | 12.42 (2.39) | 11.97 (2.68) |

$p < .001$, $\eta^2 = .09$. Simple main effect tests comparing Cyberbomb and Cyberball showed that Cyberbomb increased need satisfaction in the ostracism condition ($M_{bomb} = 3.21$, $SD = 0.99$; $M_{ball} = 2.36$; $SD = 0.77$), $F(1, 171) = 10.92$, $p < .001$, $\eta^2 = .06$, decreased need satisfaction in the over-inclusion condition ($M_{bomb} = 4.46$, $SD = 0.95$; $M_{ball} = 5.16$; $SD = 1.38$), $F(1, 171) = 4.48$, $p < .05$, $\eta^2 = .02$, and did not alter need satisfaction in the inclusion condition ($M_{bomb} = 5.05$, $SD = 0.77$; $M_{ball} = 4.91$; $SD = 1.14$), $F(1, 171) = 1.92$, *ns*. Simple mains effect tests and subsequent Tukey HSD comparisons of game experience showed that the ostracism, inclusion and over-inclusion conditions differed in both Cyberbomb, $F(1, 171) = 28.05$ , $p < .001$, $\eta^2 = .24$, and Cyberball, $F(1, 171) = 70.12$, $p < .001$, $\eta^2 = .45$.

The 3 × 2 × 2 ANOVA on mood yielded a main effect of game experience, $F(2, 171) = 9.53$, $p < .001$, $\eta^2 = .10$, and a marginal interaction effect of game experience and game type, $F(1, 171) = 2.78$, $p = .06$, $\eta^2 = .09$. Simple main effect tests comparing Cyberbomb and Cyberball showed that Cyberbomb increased mood in the ostracism condition ($M_{bomb} = 4.60$; $SD = 0.21$; $M_{ball} = 4.02$, $SD = 0.19$), $F(1, 171) = 3.85$, $p = .05$, $\eta^2 = .02$, but not the inclusion ($M_{bomb} = 5.17$; $SD = 0.21$; $M_{ball} = 5.23$, $SD = 0.22$), $F(1, 171) = .04$, $p = .85$, $\eta^2 = .00$, or over-inclusion condition ($M_{bomb} = 4.78$; $SD = 0.21$; $M_{ball} = 5.19$, $SD = 0.21$), $F(1, 171) = 1.43$, $p = .22$, $\eta^2 = .01$. Moreover, the game experience manipulation moderated mood in Cyberball, $F(1, 171) = 10.19$, $p < .001$, $\eta^2 = .10$, but not Cyberbomb, $F(1, 171) = 2.04$, $p = .13$, $\eta^2 = .02$. Specific Tukey's HSD comparisons in Cyberball showed that the mean of ostracism differed from the mean of inclusion and over-inclusion.

The overall picture of our analysis of the reflexive responses replicates our findings of Study 1. We again observe that ostracism is a painful experience compared to inclusion that is mitigated in Cyberbomb. What the current analysis adds is that being over-included in Cyberbomb is also a painful experience. And, if we consider need satisfaction, that ostracism from a Cyberbomb is more painful than being over-included in Cyberbomb. Finally, consistent with the ostracism model discussed in the introduction of the current paper (Williams, 2009), these findings were not qualified by the afterlife manipulation, a factor which we belief requires elaboration and higher levels of cognitive processing, and thus more likely to affect reflective responses.

**Reflective response** The means and standard deviations of the hot sauce allocation are given in Table 3. However, we performed a log transformation on hot sauce allocation because these data were skewed. The log sauce data that was analysed is depicted in Figure 2.

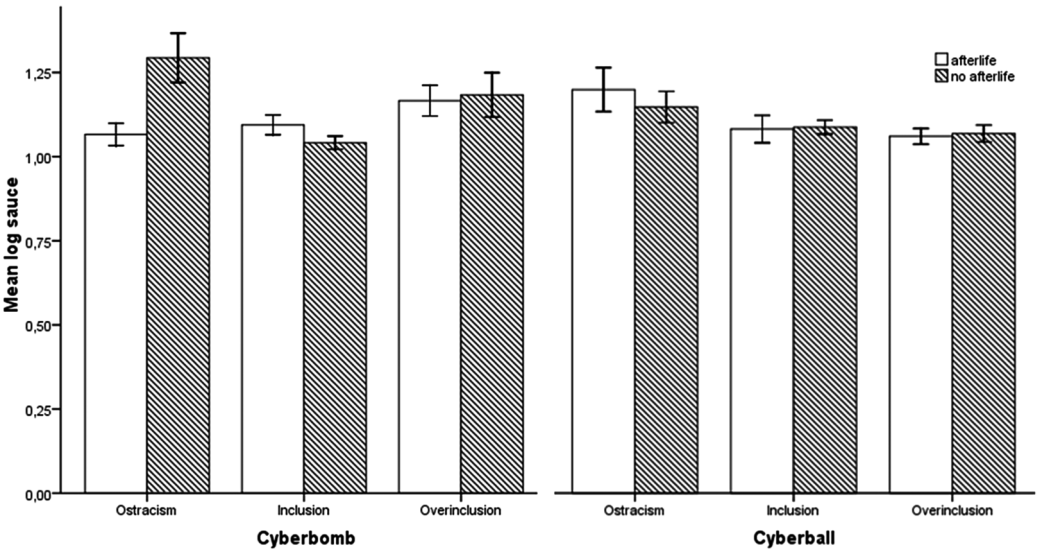


**Figure 2.** Chart of hot sauce allocation after log transformation. Capped vertical bars denote 1 standard error.

A 3 × 2 × 2 ANOVA on log-transformed hot sauce allocation yielded a main effect of game experience, $F(1, 171) = 4.78$, $p < .01$, $\eta^2 = .05$, and the predicted three-way interaction, $F(1, 171) = 3.86$, $p < .05$, $\eta^2 = .04$. To interpret this interaction we focused specifically on either the Cyberball or Cyberbomb conditions.

A 3 × 2 ANOVA on log-transformed hot sauce in Cyberball yielded only a main effect of game experience, $F(2, 78) = 3.82$, $p < .05$, $\eta^2 = .08$. Tukey's HSD tests showed that participants allocated more hot sauce to fellow game players when ostracized ($M = 1.17$, $SD = 0.22$) than when included ($M = 1.08$, $SD = 0.10$), or over-included, ($M = 1.06$, $SD = 0.08$).

A 3 × 2 ANOVA on log-transformed hot sauce allocation yielded a main effect of game experience, $F(2, 93) = 3.57$, $p < .05$, $\eta^2 = .05$. Tukey's HSD tests showed that participants allocated more hot sauce to fellow game players when ostracized ($M = 1.17$, $SD = 0.24$) or over-included ($M = 1.17$, $SD = 0.22$), than when included ($M = 1.06$, $SD = 0.10$). This shows that being ostracized from a negative situation and being over-included in a negative situation may cause people to retaliate. The analysis yielded also an interaction effect between game experience and afterlife, $F(2, 93) = 4.68$, $p < .01$, $\eta^2 = .09$.

Simple main effect tests comparing the two after life conditions revealed that the assurance of an afterlife lowered hot sauce allocation in the ostracism condition, $F(1, 93) = 10.81$, $p < .001$, $\eta^2 = .12$, but not in the inclusion or over-inclusion condition (both $F$s $< 1$). Alternatively, simple main effect tests of the game experience effect revealed that this manipulation did not affect hot sauce allocation when participants were assured of the existence of an afterlife, $F(2, 93) = 1.22$, $p = .31$, $\eta^2 = .02$. However, it did affect hot sauce allocation when participants were told that there is no scientific proof for the existence of an afterlife, $F(2, 93) = 6.89$, $p < .01$, $\eta^2 = .12$. Subsequent Tukey's HSD tests in these no afterlife conditions, showed that ostracized participants allocated more hot sauce than included individuals. The other Tukey's HSD comparisons were not significant.

In sum, the above analyses show that people may retaliate when ostracized and when over-included in Cyberbomb, but that the assurance of an afterlife reduces such aggression only in the ostracism condition. This is consistent with our

hypothesis that the assurance of an afterlife would reduce the negative impact of ostracism in Cyberbomb and not—or at least to a lesser degree—in the inclusion and over-inclusion conditions. Moreover, the fact that our afterlife manipulation did not moderate behavior in Cyberball is consistent with our proposition that Cyberbomb is related to death whereas Cyberball is not. In Cyberball participant retaliated only when ostracized and regardless of the assurance or denial of an afterlife.

## General discussion

In a series of studies we examined how people react to being included or ostracized from a game of bomb toss. Consistent with previous research in which participants were ostracized by despised outgroup members (Gonsalkorale & Williams, 2007; Smith & Williams, 2004; Williams et al., 2000), computers (Zadro et al., 2004), or from a financially harmful situation (Van Beest & Williams, 2006), we observed that participants were hurt when ostracized from a game of bomb-toss. However, for the first time in this search of how low must one go to test the power of ostracism we finally observed that this experience was less painful than being excluded from a game of ball-toss. As predicted, it suffices to make death salient by having participant play a virtual game of bomb toss to make ostracism from such a situation less painful.

Results also showed that participants were aggressive towards fellow game players when ostracized from Cyberbomb. This finding suggests that the reduced distress that was observed on the reflexive reactions after ostracism from a death game is still powerful enough to evoke aggression. More relevant, is that such aggressive responses are moderated by scientific evidence in favor or against the existence of an afterlife. Participants who were ostracized from Cyberbomb only retaliated when they were provided evidence against the existence of an afterlife. They did not retaliate when they were assured of the existence of an afterlife. This is consistent with our suggestion that an afterlife provides a future sense of belonging that reduces aggressive behavior. Moreover, the fact that this reduction was only observed in Cyberbomb and not in Cyberball is consistent with our reasoning that Cyberbomb is more related to survival than Cyberball.

On a more general level our findings contribute to Williams's model of ostracism (Williams, 2009). According to this model it is important to make a temporal distinction between responses that assess the immediate experience of ostracism (i.e., reflexive responses) and more delayed coping or goal directed behaviors (i.e., reflective responses) because people are more likely to disregard mitigating information during or directly after being ostracized than when people have time to form a cognitive appraisal of the situation. Consistent with this difference we found that providing participants with scientific evidence in favor of or against the existence of an afterlife did not affect self-reports of needs or mood that assessed the experience of being ostracized. Instead, the afterlife manipulation only affected our measure of retaliation which was assessed when considerable time had passed and which we assume is based on more thorough evaluation of all the aspects that are relevant to understand a situation. Indeed, the fact that the afterlife manipulation only affected reflective behavior in Cyberbomb and not Cyberball extends prior research on cross-cutting variables and reflective behavior with the notion that such cross-cutting variables need to be relevant to form an appraisal of the situation.

### *A linear function of inclusionary status?*

Introducing an over-inclusion condition allowed the possibility to compare two different situations in which people stand out. In the ostracism condition individuals stand out because they do not get any attention. They receive less attention than expected. In the over-inclusion condition individuals stand out because they receive more attention than expected. This allowed us to assess whether the experience of ostracism can be viewed as a continuum that ranges from ostracism, through inclusion, to over-inclusion (see

also Leary, 1990). Replicating the work of Van Beest and Williams (2006) we again observed a difference between these two ends of the inclusionary status continuum. Reflexive and reflective responses were not congruent when people were ostracized. However, they were congruent when people were over-included. This is consistent with Leary's (2005) assertion that conceptualizing rejection as an index of inclusionary status ranging from maximal exclusion to maximal inclusion may be useful for capturing the effort people use to reject others, but it may not be useful in accounting how victims of rejection respond to rejection.

More important is that our Cyberbomb paradigm also allowed us to compare how (a) people respond when ostracized and (b) how people respond when over-included in a negative situation. To the extent that over-inclusion in a negative situation can be viewed as a form of punitive attention, it may thus be argued that this allowed us to compare two forms of rejection: ostracism and bullying (Van Beest & Williams, 2006; Zadro, Williams, & Richardson, 2005). The current findings show that both these forms of rejection are perceived as painful and that both these forms of rejection may infuse aggression. This corroborates the suggestion that both ostracism and bullying are possible antecedents of aggressive behavior (Junoven & Gross, 2005). For example, studies of the infamous school shootings in the United States reveal that many of the adolescent who hurt and killed their fellow schoolmates were allegedly rejected and bullied by their peers (Leary et al., 2003).

### *Limitations and further research*

We used self-reports of fundamental needs and mood to assess how people experience ostracism. Similar to previous research on ostracism we combined belonging, self-esteem, control, and meaning in one overall need satisfaction measure, and various emotions in one measure of mood. We provided these separate analyses because this allows a more careful comparison with previous research on ostracism where these constructs are analysed in a similar fashion. We realize that these measures are correlated and that they are only a proxy of whether participants are truly hurt. We take comfort from the fact that research has shown that such responses are highly correlated with brain activity in the dACC—a structure that is also know to be active when people are physically hurt (Eisenberger et al., 2003). Future research may also investigate such brain activity during Cyberbomb. We expect that the unique survival threat that is afforded by Cyberbomb may also moderate dACC activity when participants are ostracized. Moreover, it may be noted that we measured reflexive reactions with self-reported fundamental needs and mood whereas we measured reflective reactions with a behavioral retaliation measure. However, we are not arguing that retaliation cannot be reflexive or that self-reported needs and mood cannot be reflective. After all, prior research on aggression has repeatedly shown that aggressive acts may occur without much deliberation or thought (Berkowitz, 1990; Berkowitz & Harmon-Jones, 2004). The point is that we measured the need-satisfaction and mood measures first and retaliation second. Further research may pursue a research agenda in which one varies the order of dependent variables and also consider more closely how much time needs to pass to alter a reflexive response into a more reflective response.

We also acknowledge that retaliation or aggression is but one example of coping behavior to ostracism. Indeed, several researchers have shown that people use other coping mechanisms. For example, researchers have now shown that ostracism increases social attention (Pickett & Gardner, 2005), attempts to reconnect (Maner, DeWall, & Baumeister, 2007), good citizenship (Ouwerkerk, Kerr, Galluci, & van Lange, 2005), unconscious mimicry (Lakin & Chartrand, 2005), collective effort (Williams & Sommer, 1997), conformity (Williams et al., 2000), and compliance (Carter-Sowell, Chen, & Williams, 2008). Moreover, Williams' ostracism model argues that antisocial coping responses are associated with control and meaning whereas prosocial responses are associated with belonging and self-esteem.

This would imply that our retaliation measure should replenish control and meaning more than belonging and self-esteem. However, because we did not include such measures after the retaliation measure we cannot affirm whether this was also the case in the current study. To also focus on these other types of coping behavior and associated needs was beyond the scope of the current article. We showed that cross-cutting variables that are relevant to evaluate the implications of a situation may mitigate antisocial responses to ostracism. We assume that a similar pattern would emerge when testing more prosocial responses and that such responses are indeed associated with recovery of specific needs.

### *Cyberbomb and terror management*

We set out to test a model of ostracism but realize that our results can be compared with research on terror management. From research on terror management we know that people defend their worldview when mortality is salient (Greenberg et al., 1997), and even punish those that threaten their worldview (McGreggor et al., 1998). Moreover, research on terror management has shown that mortality salience increases need for affiliation (Wisman & Koole, 2003) and that the belief in an afterlife reduces the effect of mortality salience (Dechesne et al., 2003). Consistent with this reasoning we observed that aggressive reactions in Cyberbomb are reduced when people are provided evidence in favor of the existence of an afterlife. Moreover, consistent with terror management we observed that death thoughts are more accessible in Cyberbomb than in Cyberball. However, we are not sure whether terror management would also predict that people are less hurt by ostracism from Cyberbomb than by ostracism from Cyberball. Or that people are more hurt when over-included in Cyberbomb than when over-included in Cyberball. After all, provided that terror management increases need for affiliation, one could also argue that people should be more hurt by ostracism (and enjoy being over-included) when death is made salient than when death is not made salient. In sum, we believe that our conceptualization of Cyberbomb as an easy recognizable threat provides the most parsimonious explanation. This conceptualization of Cyberbomb fits the data that people do not enjoy being over-included, but do enjoy being ostracized. Under which conditions Cyberbomb is or is not akin to a standard mortality salience manipulation such as telling people to consider what would happen to them when they physically die is an interesting line of further research.

At this point is also relevant to reiterate that Cyberbomb is thus more than simply an aversive stimulus from which ostracism provides an escape. The unique aspect of Cyberbomb that sets it apart from previous aversive situations that have been studied—for example—losing money (Van Beest & Williams, 2006) or despised outgroup members (Gonsalkorale & Williams, 2007)—is that Cyberbomb is related to survival. Put differently, we believe that previous research failed to moderate the immediate experience of ostracism because the cross-cutting variable requires more elaborate cognitive processing than cues that are more directly related to survival. Moreover, we do not believe that our effects are driven by attributions of benevolence. That is, we do not believe that our participants are less hurt by ostracism because they inferred that the others must like them. After all, if such an interpretation is valid, one would also expect that being ostracized from a financially costly situation would lessen the impact of ostracism. Then again, we did not assess attributions of benevolence. Nor, did we directly compare various aversive situations. We only focused on Cyberbomb and Cyberball. Future research may integrate research on financial threats and survival threats. We would predict that only the survival threat will mitigate the experience of ostracism.

Finally, it should be noted that our manipulation of game type moderated only the situations in which participants stand out. Whether players tossed around a ball or a bomb affected the ostracism condition and the over-inclusion condition, but not the inclusion condition. This draws attention to the fact that the inclusion

condition that is often used in ostracism research is a very specific form of inclusion that is characterized by the fact that people are equally included. The more important conclusion is that the positive and negative aspects of a situation are apparently assessed in relative terms. Only when people stand out they process whether or not the stand out in a positive or negative way, a line of thought that is also central in recent research on partial ostracism (Jones, Carter-Sowell, Kelly, & Williams, 2009).

## *To conclude*

As we try to understand the plight of individuals who are habitually ostracized because of their status, group membership, or other distinguishing characteristics, we need to examine both reflexive reactions that might result in unthinking or automatic responses, and reflective reactions that employ personal dispositions, externally-provided information, and situational constraints that result in anti-social (and, with further research, possibly pro-social) strategies, goals, and behaviors. We showed that a symbolic survival threat mitigated how people experience ostracism and that the assurance that life does not end at death reduced aggression against fellow game players. These results speak to the intimate relation between ostracism and survival that has been proposed in theories of belonging (Baumeister & Leary, 1995), rejection (Leary, 2001) and ostracism (Williams, 2009).

## Notes

This research was supported by a Veni grant NWO-451-04-069 from the Netherlands Organization for Scientific Research awarded to Ilja Van Beest and by a National Science Foundation Grant 0519209-BCS and Australian Research Council grant awarded to Kipling D. Williams.

We thank Wolfgang Steinel, and Sander Koole for their comments on an earlier version of this paper and Jim Wirth for helping us collecting data.

1 Need-satisfaction and mood were correlated (r = .77) and an analysis in which need-satisfaction and mood are integrated in an overall measure of distress yielded a similar picture as the separate analysis of need satisfaction and mood.

2 Need-satisfaction and mood were correlated (r = .66) and an analysis in which need-satisfaction and mood are integrated in an overall measure of distress yielded a similar picture as the separate analysis of need satisfaction and mood.

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